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<p>(21) International Application Number: PCT/GB92/00795</p> <p>(22) International Filing Date: 30 April 1992 (30.04.92)</p> <p>(30) Priority data: 9109470.6 2 May 1991 (02.05.91) GB</p> <p>(71) Applicant (for all designated States except US): PECO MACHINE SHOP & INSPECTION SERVICES LIMITED [GB/GB]; Silverburn Place, Bridge of Don, Aberdeen AB2 8EG (GB).</p> <p>(72) Inventor; and (75) Inventor/Applicant (for US only) : HARDIE, James, Fraser [GB/GB]; 5 Craighton Drive, Peterculter, Aberdeen AB1 0SS (GB).</p> <p>(74) Agent: ORR, William, McLean; Urquhart-Dykes & Lord, Tower House, Merriion Way, Leeds LS2 8PA (GB).</p>		<p>(81) Designated States: AT (European patent), BE (European patent), BF (OAPI patent), BJ (OAPI patent), CF (OAPI patent), CG (OAPI patent), CH (European patent), CI (OAPI patent), CM (OAPI patent), DE (European patent), DK (European patent), ES (European patent), FR (European patent), GA (OAPI patent), GB, GB (European patent), GN (OAPI patent), GR (European patent), IT (European patent), LU (European patent), MC (European patent), ML (OAPI patent), MR (OAPI patent), NL (European patent), NO, SE (European patent), SN (OAPI patent), TD (OAPI patent), TG (OAPI patent), US.</p> <p>Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p>
<p>(54) Title: PIPE CLEANER DEVICE</p> <div style="text-align: center;"> </div> <p>(57) Abstract</p> <p>There is disclosed a pipe cleaner device (10) which is operable to scrape the inner wall surface of a pipe along which the device is caused to travel, such as a casing and/or liner extending upwardly from a wellbore of an oil production installation, and which allows the material scraped-off the wall of the pipe to pass to the interior of the device for subsequent removal after withdrawal of the device from the pipe, and the device comprising: a leading cylindrical housing (11) having external scraping means (12), a guide nose (13) arranged at the leading end of housing (11) to guide the introduction of the device into a pipe, and having inlet ports (13a) which allow material scraped from the pipe wall to pass to the interior of the housing (11), a catcher device (21) arranged in the housing to retain material admitted to the housing via the inlet (13a), a trailing cylindrical housing (14) coupled with the trailing end (15) of the leading housing (11) to communicate with the interior of the latter and having an outlet (16) so that fluid admitted through the inlet (13a) of the leading housing (11) can pass through both housings and exit via the outlet, and a magnetic device (17) arranged in the trailing housing (14) along the path of travel of the fluid in order to extract magnetic particles borne by the fluid and to retain such particles on the magnetic device.</p>		

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PIPE CLEANER DEVICE

This invention relates to a pipe cleaner device which is operable to scrape the inner wall surface of a pipe along which it is caused to travel, and to allow the material scraped-off the wall of the pipe to pass to the interior of the device for subsequent removal after withdrawal of the device from the pipe.

The invention has been developed primarily, though not exclusively, in connection with a pipe cleaner device for use in cleaning-up and drifting a casing and / or liner extending upwardly from a wellbore, prior to running of a "completion string" or a "production packer" while avoiding any part of the tool to be left in the wellbore.

According to the invention there is provided a pipe cleaner device which is operable to scrape the inner wall surface of a pipe along which the device is caused to travel, and to allow the material scraped-off the wall of the pipe to pass to the interior of the device for subsequent removal after withdrawal of the device from the pipe, and said device comprising:

- a leading cylindrical housing having external means for scraping the wall of the pipe;

- a guide nose arranged at the leading end of the housing to guide the introduction of the device into a pipe;

- an inlet to the housing arranged to allow material scraped from the pipe wall to pass to the interior of the housing;

- a catcher device arranged in the housing to retain material admitted to the housing via the inlet;

- a trailing cylindrical housing coupled with the trailing end of the leading housing and communicating with the interior of the latter, the trailing housing having an outlet so that fluid admitted through the inlet of the leading housing can pass through both housings and exit via

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the outlet: and.

a magnetic device arranged in the trailing housing along the path of travel of the fluid in order to extract magnetic particles borne by the fluid and to retain such particles on the magnetic device.

The material scraped-off the wall of the pipe will comprise magnetic particles, and therefore this material can be readily scraped-off and then retained within the device, prior to withdrawal of the device from the pipe and removal of the material at periodic intervals.

The preferred use of the pipe according to the invention will be in cleaning-up and drifting the casing and / or lining extending upwardly from a wellbore, prior to running of a usual completion string or a production packer, while avoiding any part of the tool to be left in the wellbore.

Therefore, the device can be lowered down a pipe via a braided line connected to the upper end of the trailing housing.

The scraping means on the leading housing may comprise a gauge cutter mechanism, and preferably the arrangement is such that the mechanism can be disconnected from the housing, by a shearing action, in the event of any blockage occurring in the pipe.

Preferably, large outlet flow ports are provided in the wall of the leading housing, which are normally covered by the cutter mechanism, but which are uncovered upon shearing of the connection of the cutter mechanism so as to allow "junk" particles in the housing to by-pass the device via the outlet ports, and thereby allow easy withdrawal of the device.

Embodiments of pipe cleaner device according to the invention will now be described in detail, by way of example only, with reference to the accompanying drawings, in which:

Figure-1 is a longitudinal sectional view of a first embodiment of pipe cleaner device according to the invention, for use in cleaning or drifting a casing and / or liner

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extending upwardly from a wellbore:

Figure 2 is an end view, to an enlarged scale, of a leading end of the pipe cleaner device and taken in the direction of the arrow X in Figure 3:

Figure 3 is a sectional view taken on the section line A-A in Figure 2:

Figure 4 is a longitudinal sectional view of a further embodiment of pipe cleaner according to the invention; and

Figure 5 is an enlarged view of a detail of Figure 4.

Referring now to Figures 1 to 3 of the drawings, a pipe cleaner device according to the invention is designated generally by reference 10, and is operable to scrape the inner wall surface of a pipe (not shown) along which the device is caused to travel, and to allow the material scraped-off the wall of the pipe to pass to the interior of the device for subsequent removal after withdrawal of the device from the pipe.

The device 10 comprises a leading cylindrical housing 11 having external means for scraping the wall of the pipe and in the form of a gauge cutter mechanism designated generally by reference 12. A guide nose 13 is arranged at the leading end of the housing 11 to guide the introduction of the device into a pipe, and has a series of inlet ports 13a which form an inlet to the housing 11 which allows material scraped from the pipe wall (or any other loose "junk" within the pipe) to pass to the interior of the housing. A catcher device is arranged in the housing 11 to retain material admitted to the housing via the inlet, and comprises a circular array of leaf springs 21 (only one of which is shown in Figure 1) which can be displaced outwardly of the central axis of the device by the junk, but then springs back to retain the junk in the housing 11.

The housing 11 is a non-magnetic cylinder, in the bottom of which the leaf spring junk catcher 21 is arranged so as to allow junk and debris to enter the cylinder, but to prevent it from falling back into the well when pulling the

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device out of the well.

A trailing cylindrical housing 14 is coupled with the trailing end 15 of the leading housing 11 and communicates with the interior of the latter. the trailing housing 14 having an outlet 16 so that fluid e.g mud admitted through the inlet of the leading housing 11 can pass along both housings and then exit via the outlet.

A magnetic device 17 is arranged in the trailing housing 14 along the path of travel of the fluid passing through the housings 11. 14 in order to extract magnetic particles borne by the fluid and to retain such particles on the magnetic device.

The material scraped-off the wall of the pipe will comprise magnetic particles. and therefore this material can be readily scraped-off and then retained within the device. and then removed after withdrawal of the device from the pipe.

The preferred use of the pipe cleaner device 10 is in cleaning-up and drifting the casing and / or lining extending upwardly from a wellbore. prior to running of a usual completion string or a production packer. while avoiding any part of the tool to be left in the wellbore.

The device 10 therefore can be lowered down a pipe via a braided line connected to the upper end 18 of the trailing housing 14.

The scraping means 12 on the leading housing 11 preferably comprises a gauge cutter mechanism. and the arrangement is such that the mechanism can be disconnected from the housing. by a shearing action. in the event of any blockage occurring in the pipe. Figures 2 and 3 show enlarged views of the leading end of the leading housing 11. and shows shear pins 19 which allow the gauge cutter mechanism to be disconnected from the housing 11 in the event of a blockage. and when this occurs. eight large outlet flow ports 20 in the wall of the housing 11 become uncovered. so as to allow "junk" particles in the housing to by-pass the

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device and thereby allow easy withdrawal of the device from a pipe.

Accordingly, the embodiment of pipe cleaner device described above is made-up of the following components:

an interchangeable bottom sub-assembly, which is designed to gauge and cut foreign material in order to clean the casing wall:

the bottom sub-assembly 11 has a four arm star nose 13 with a one and one sixteenth inch SR threads to guide the device (referred to herein as a "junk basket") into the liner top. The bottom sub-assembly is also designed with a unique splitting mechanism which allows junk and fluid to by-pass when pulling the device out of the well. The bottom sub-assembly is made-up of a non-magnetic cylinder which collects and retains junk and debris;

in the bottom of the non-magnetic cylinder, there is arranged a leaf spring junk catcher 21 which allows junk and debris to enter the cylinder, and prevents it from falling back into the well when pulling the device out of the well;

the non-magnetic cylinder is then assembled with a top sub-assembly 14, which connects the tool to the usual wire line tool string. Inside the top sub-assembly, a powerful magnet is mounted, and the upper sub-assembly also comprises a non-magnetic cylinder. The magnet therefore can catch and retain all magnetic particles caught by the junk basket and magnetic particles in the fluid that passes alongside the magnet.

Although not shown in Fig. 1, a bow spring centraliser may surround the cylinder in order to centralise the junk basket.

The operation of the magnetic junk basket will now be described. The magnetic junk basket is designed to be lowered into the well on a braided line. The gauge cutter on the bottom sub-assembly will clean and drift the tubing or line running down to the well.

Fluid will pass through the cylinder and out the flow

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ports located at the top of the cylinder. Junk and magnetic particles will be caught by the leaf spring junk catcher and by the magnet.

When entering a liner top, the star nose will guide the tool into the liner. the bow spring centraliser will help to guide it, and when withdrawing, the leaf spring centraliser will keep the junk from falling out.

However, if junk should fall down on top of the tool and cause it to become stuck, the unique split mechanism will split by shearing of the pins, allowing eight large ports to open so that junk can by-pass, and also to allow the junk basket to be retrieved from the well.

The following features, in general terms, are believed to be unique in the illustrated embodiment of pipe cleaner according to the invention:

1. The magnet located inside a cylinder, and arranged such that all the fluid has to pass alongside the magnet, so that all magnetic particles can be caught by the magnet;

2. The gauge cutter split mechanism, which is arranged such that the large area of the bottom part of the bottom sub-assembly facing up will allow the bottom sub-assembly to split by shearing, and allow junk to by-pass via eight large flow ports;

3. An integrated centralisation system.

A further embodiment of pipe cleaner device is shown in Figs. 4 and 5 of the drawings, which is generally similar to the first embodiment, and which will now be described.

The further embodiment is designated generally by reference 100 and comprises a leading cylindrical housing 101 built up from a lead housing section 102 in threaded connection with a housing 103 in which a circular array of 16 leaf springs 104 are mounted to form a junk catcher device, operating in generally similar manner to the leaf springs 21 shown in Fig. 1.

A guide nose 105 is arranged at leading end of housing 101, and guides the introduction of the device into a pipe,

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and has a series of inlet ports 106 which admit fluid. "junk" and material scraped from the wall of the pipe to enter housing 101.

Housing 101 is a non-magnetic cylinder, which accommodates the leaf spring junk catcher 104, and external gauge means for scraping the wall of the pipe comprises a gauge cutter mechanism 107 which is connected to lead housing section 102 by a shearable connection formed by a set of four shear pins 108.

Figure 5 is an enlarged view of a detail showing the assembly of the gauge cutter mechanism 107, comprising cap screw 109, retaining screw 110 and nut 111 which is tack welded in place after assembly.

The trailing part of the device 100 comprises trailing tubular housing 112, having at its upper end a "top sub" 113, to the upper end of which a braided line can be connected in order to lower the device 100 down a pipe to be scraped-clean.

Trailing housing 112 accommodates internally a magnetic device 114 to which magnetic junk debris is attracted and adjoins, after passage of this debris through the device 100 with mud or other fluid present in the pipe.

A centraliser 115 is mounted externally on a mid-region of the trailing housing 112, and serves to centralise the device 100 during movement along the pipe to be cleaned.

Although not shown in detail, a trailing housing 112 will have an outlet port, similar to outlet port 16 shown in Fig. 1, to allow fluid to be discharged from internally of the device 100 during passage along the pipe.

CLAIMS

1. A pipe cleaner device (10) which is operable to scrape the inner wall surface of a pipe along which the device is caused to travel, and to allow the material scraped-off the wall of the pipe to pass to the interior of the device for subsequent removal after withdrawal of the device from the pipe, and said device comprising:

a leading cylindrical housing (11) having external means (12) for scraping the wall of the pipe;

a guide nose (13) arranged at the leading end of the housing (11) to guide the introduction of the device into a pipe;

an inlet (13a) to the housing arranged to allow material scraped from the pipe wall to pass to the interior of the housing;

a catcher device (21) arranged in the housing to retain material admitted to the housing via the inlet;

a trailing cylindrical housing (14) coupled with the trailing end of the leading housing and communicating with the interior of the latter, the trailing housing having an outlet (16) so that fluid admitted through the inlet (13a) of the leading housing can pass through both housings (11, 14) and exit via the outlet; and,

a magnetic device (17) arranged in the trailing housing (14) along the path of travel of the fluid in order to extract magnetic particles borne by the fluid and to retain such particles on the magnetic device.

2. A pipe cleaner device according to claim 1, in which the scraping means on the leading housing comprises a gauge cutter mechanism (12).

3. A pipe cleaner device according to claim 2, in which the gauge cutter mechanism (12) is disconnectable from the housing by a shearing action (19), in the event of any blockage occurring in the pipe.

4. A pipe cleaner device according to claim 2 or 3, in which large outlet flow ports (20) are provided in the wall

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of the leading housing (11) and which are covered by the cutter mechanism (12) during normal operation, but are uncovered upon shearing of the connection (19) of the cutter mechanism so as to allow junk particles in the housing (11) to by-pass the device via the outlet ports (20), and thereby allow easy withdrawal of the pipe cleaner device.

5. A pipe cleaner device according to any one of claims 1 to 4, in which the catcher device comprises an internal array of leaf springs (21) which are deformable outwardly of the central axis of the device to allow junk to move through the leading housing (11), and then to spring back to a position for retaining the junk during withdrawal of the device from a pipe.

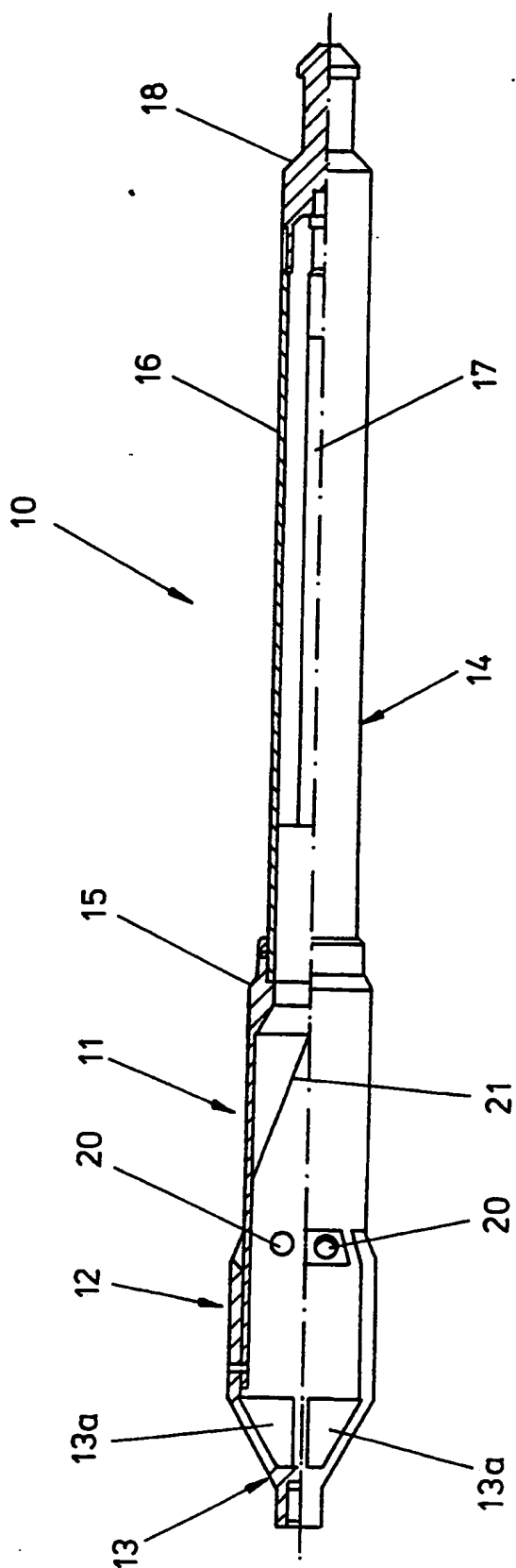


FIG. 1

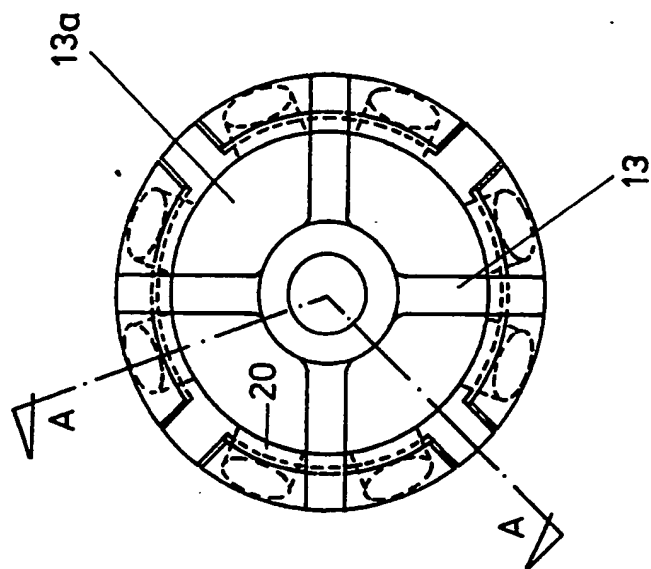


FIG. 2

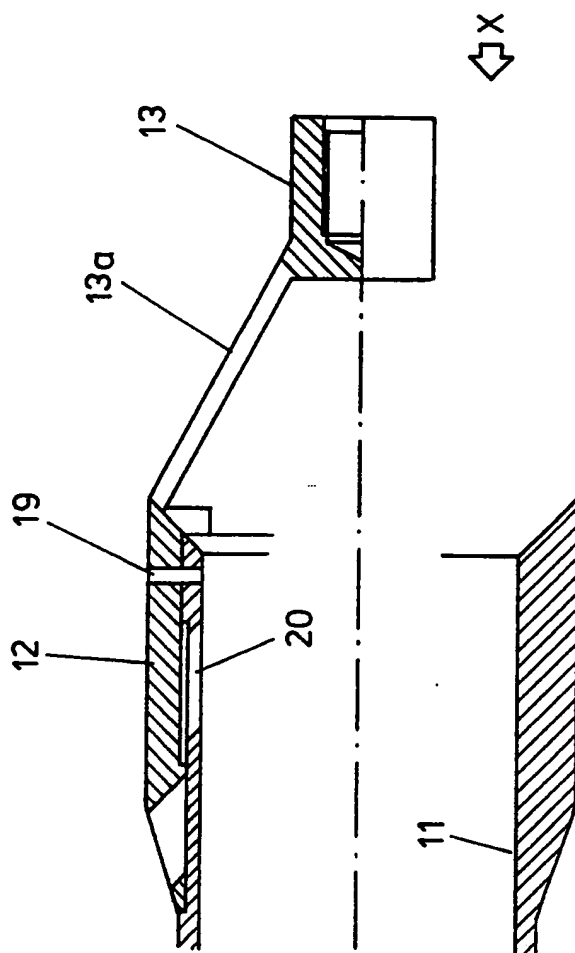


FIG. 3

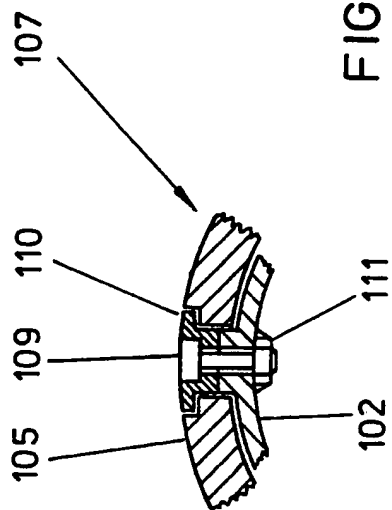


FIG. 5

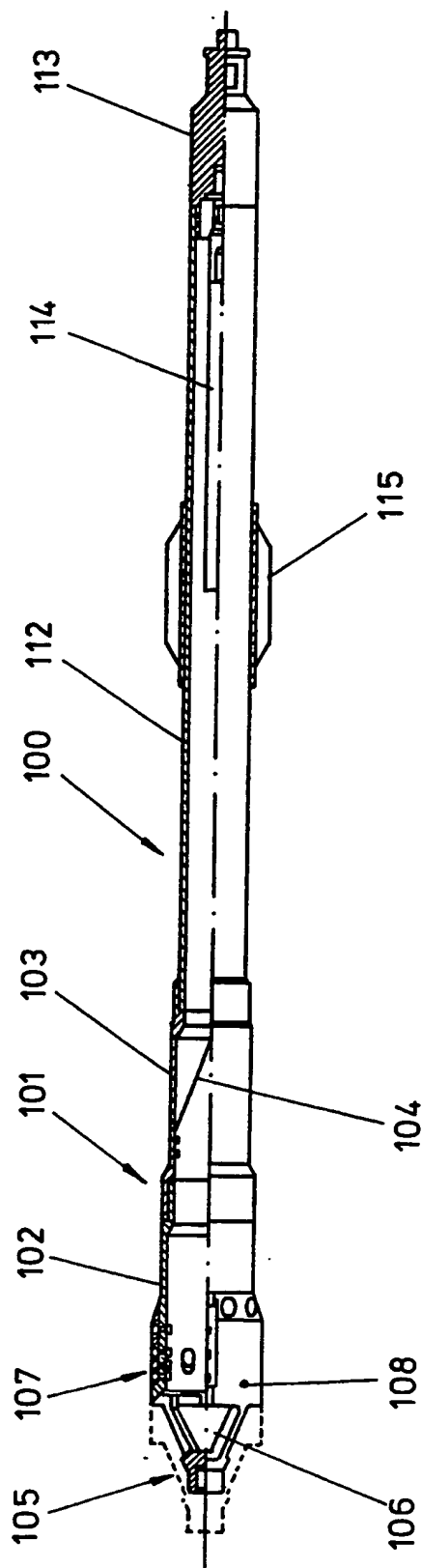



FIG. 4

INTERNATIONAL SEARCH REPORT

International Application 1

PCT/GB 92/00795

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) ⁶		
According to International Patent Classification (IPC) or to both National Classification and IPC		
Int.C1. 5 E21B37/02; B08B9/04		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁷		
Classification System	Classification Symbols	
Int.C1. 5	E21B ; B08B	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸		
III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹		
Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
Y	US,A,4 515 212 (M.E.KRUGH) 7 May 1985 see column 4, line 22 - line 29 see column 5, line 34 - line 36 see column 6, line 33 - line 39; figures 1,6 ---	1
Y	US,A,4 332 296 (N.E.WAYT) 1 June 1982 see column 4, line 23 - line 27; figure 1 ---	1
Y A	US,A,3 020 079 (H.SAMOL) 6 February 1962 see the whole document ---	1 5
A	US,A,4 703 804 (R.L.STOKES ET AL.) 3 November 1987 see column 4, line 1 - line 20 see column 4, line 29 - line 42 ---	2,3
-/-		
¹⁰ Special categories of cited documents : ^{"A"} document defining the general state of the art which is not considered to be of particular relevance ^{"E"} earlier document but published on or after the international filing date ^{"L"} document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) ^{"O"} document referring to an oral disclosure, use, exhibition or other means ^{"P"} document published prior to the international filing date but later than the priority date claimed ^{"T"} later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention ^{"X"} document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step ^{"Y"} document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. ^{"&"} document member of the same patent family		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
13 AUGUST 1992	61.09.92	
International Searching Authority	Signature of Authorized Officer	
EUROPEAN PATENT OFFICE	RAMPELMANN K. 	

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
A	DE,C,3 129 682 (J.BIESTERFELD) 27 January 1983 see the whole document ---	1

**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO. GB 9200795
SA 58866**

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A-4515212	07-05-85	US-A- 4603739	05-08-86
US-A-4332296	01-06-82	None	
US-A-3020079		None	
US-A-4703804	03-11-87	None	
DE-C-3129682	27-01-83	None	